

## 1. Features and Benefits

- Converts light intensity to voltage
- High linearity
- Low temperature dependency
- Supply voltage range 3V to 5.5V
- Open drain output voltage output
- Automotive Cavity SO8 package
- Designed for automotive applications
- Solder reflow 260degC, MSL3
- Automotive qualified AEC-Q100 Grade 1
- Operating temperature -40 up to 125degC
- RoHS compliant lead-free

## 2. Application Examples

- General
  - Ambient Light Sensor
  - LCD Backlight Sensor
  - LED Power Monitoring
- Automotive
  - Automatic light dimming of instrument panels and displays
  - Electrochrome Dimming
  - Headlights on/off control
- Printers/Copiers
  - Paper feed detection
  - Paper size and orientation detection
  - Toner cartridge presence detection

## 3. Functional Diagram

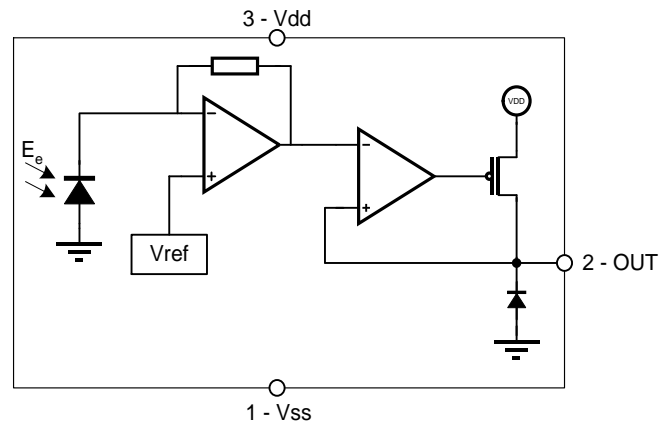


Figure 1

## 4. General Description

The Melexis SensorEyeC series are CMOS integrated optical sensor ICs including photodiode, transimpedance amplifier and output transistor on one chip. These sensors are designed for high-volume automotive and non-automotive applications.

The MLX75305 Light-to-Voltage SensorEyeC converts ambient or LED light intensity into an output voltage.

The MLX75305 block diagram is shown above and contains following blocks: a photodiode, a transimpedance amplifier to convert and amplify the photocurrent of the photodiode and an open drain output buffer stage.

## 5. Ordering Information

| Product  | Temperature        | Package | Option Code | Packing Form |
|----------|--------------------|---------|-------------|--------------|
| MLX75305 | K (-40°C to 125°C) | XD      | AAA-000     | RE           |
| MLX75305 | K (-40°C to 125°C) | XD      | ABA-000     | RE           |

### Legend:

|                   |   |
|-------------------|---|
| Temperature Code: | K for Temperature Range -40°C to 125°C                      |
| Package Code:     | XD for SOIC-8 package                                       |
| Option Code:      | AAA-xxx: Responsivity Gain10<br>ABA-xxx: Responsivity Gain1 |
| Packing Form:     | RE for Reel   |
| Ordering Example: | MLX75305EXD-AAA-000-RE                                      |

*Table 1*

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## 6. Pin Definitions and Descriptions

| Pin # | Name | Description       | Type              |
|-------|------|-------------------|-------------------|
| 1     | Vss  | Ground connection | Ground            |
| 2     | OUT  | Analog output     | Open drain output |
| 3     | Vdd  | Power supply      | Supply            |
| 4     | N.C. | Not connected     | Floating          |
| 5..8  | N.C. | Not connected     | Floating          |

Table 2

## 7. Absolute Maximum Ratings

Valid for all MLX75305 versions. All voltages are referenced to Vss.

| Symbol   | Rating   | Value           | Unit |
|----------|--|-----------------|------|
| Vdd      | Supply Voltage, VDD (over voltage)                           | -0.3 to 7       | V    |
| Vout     | DC Output Voltage  | -0.3 to Vdd+0.3 | V    |
| Iout     | DC Output Current, per Pin                                   | ±20             | mA   |
| TStg     | Storage Temperature Range, TS                                | -40 to 125      | °C   |
| VESD-HBM | ESD Sensitivity (Human Body Model according to CDF-AEC-Q100) | 4               | kV   |
| VESD-MM  | ESD Sensitivity (Machine Model according to CDF-AEC-Q100)    | 200             | V    |

Table 3

Exceeding the absolute maximum ratings may cause permanent damage. Exposure to absolute maximum-rated conditions for extended periods may affect device reliability.

## 8. General Electrical Specifications

All voltages are referenced to Vss.

| Symbol               | Parameter                               | Conditions  | Min    | Typ           | Max        | Unit                         | Test <sup>1</sup> |
|----------------------|---|---|--------|---------------|------------|------------------------------|-------------------|
| Vdd                  | Supply Voltage                          |   | 3      |               | 5.5        | V                            | V                 |
| Idd                  | Static Power Supply Current             | At Vdd=5.5V,<br>unloaded output   |        |               | 2          | mA                           | V                 |
| Vdark                | Dark level                              | (a), (c) Ee=0<br>Tamb=-40 .. 85°C<br>Tamb=85 .. 125°C                   | 4<br>4 |               | 160<br>210 | mV<br>mV                     | V<br>V            |
| Re10                 | Responsivity Gain 10 (option<br>code A) | (a), Vout range =<br>50mV..4.5V, 25°C                                   | -15%   | 70            | +15%       | mV/(μW/<br>cm <sup>2</sup> ) | V                 |
| Re1                  | Responsivity Gain 1 (option<br>code B)  | (a), Vout range =<br>50mV..4.5V, 25°C                                   | -15%   | 7             | +15%       | mV/(μW/<br>cm <sup>2</sup> ) | V                 |
| NLAO                 | RMS Non Linearity                       | (a), in the 10..90%<br>Output Range                                     |        |               | +/-2       | %                            | V                 |
| TC                   | Temperature Coefficient                 | (b), Ee=46μW/cm <sup>2</sup><br>For visual light:<br>For NIR (λ=850nm): |        | -0.16<br>0.06 |            | %/C<br>%/C                   | X<br>X            |
| λ0.3                 | Spectral Bandwidth                      | Tamb=25°C   | 500    |               | 1000       | nm                           | X                 |
| E <sub>max</sub>     | Absolute Maximum Irradiance             | Vdd=5V, λ=850nm,<br>Tamb=25°C   |        | 50*E<br>Vout  |            | μW/cm <sup>2</sup>           | X                 |
| Spd                  | Area of photodiode                      |   |        | 0.36          |            | mm <sup>2</sup>              | D                 |
| VOH                  | Maximum Output voltage high             | (a),<br>Ee=15*E <sub>Vout</sub> ...E <sub>max</sub>                     | 4.9    | 4.95          |            | V                            | V                 |
| tVdd <sub>rise</sub> | Vdd rise time                           | 10..90% of Vdd  |        | 4             |            | μs                           | V                 |
| tsetup               | Electrical setup-time                   | (a), Vout within Vdd/2<br>+/- 5%  |        | 70            | 140        | μs                           | V                 |

<sup>1</sup> The column Test indicates if the specific parameter is tested in production. Following symbols are used:  
V: the specific parameter is tested in production  
X: the specific parameter is verified in characterization, but is not tested in production (e.g. timings and capacitances)  
D: the specific parameter is guaranteed by design and is not tested as such in production

|      |                             |                     |     |    |     |    |   |
|------|-----------------------------|---------------------|-----|----|-----|----|---|
| ton  | Turn-on time                | (a), Vout > VOH_min |     | 6  | 50  | μs |   |
| toff | Turn-off time               | (a), Vout > VOH_min |     | 6  | 50  | μs | V |
| tr   | Rise time                   | (a), Vout > VOH_min |     | 10 | 22  | μs | V |
| tf   | Fall time                   | (a), Vout > VOH_min |     | 10 | 22  | μs | V |
| TA   | Operating Temperature Range | Temperature Code K  | -40 |    | 125 | °C | V |

Table 4

(a) Vdd=5V, RL=10kOhm, CL=50pF, λ= 850nm

(b) Vdd=5V, RL=10kOhm, CL=50pF

(c) The dark level is ratio metric with the Vdd power supply voltage

# 9. Spectral Responsivity and Linear Optical Response Curve

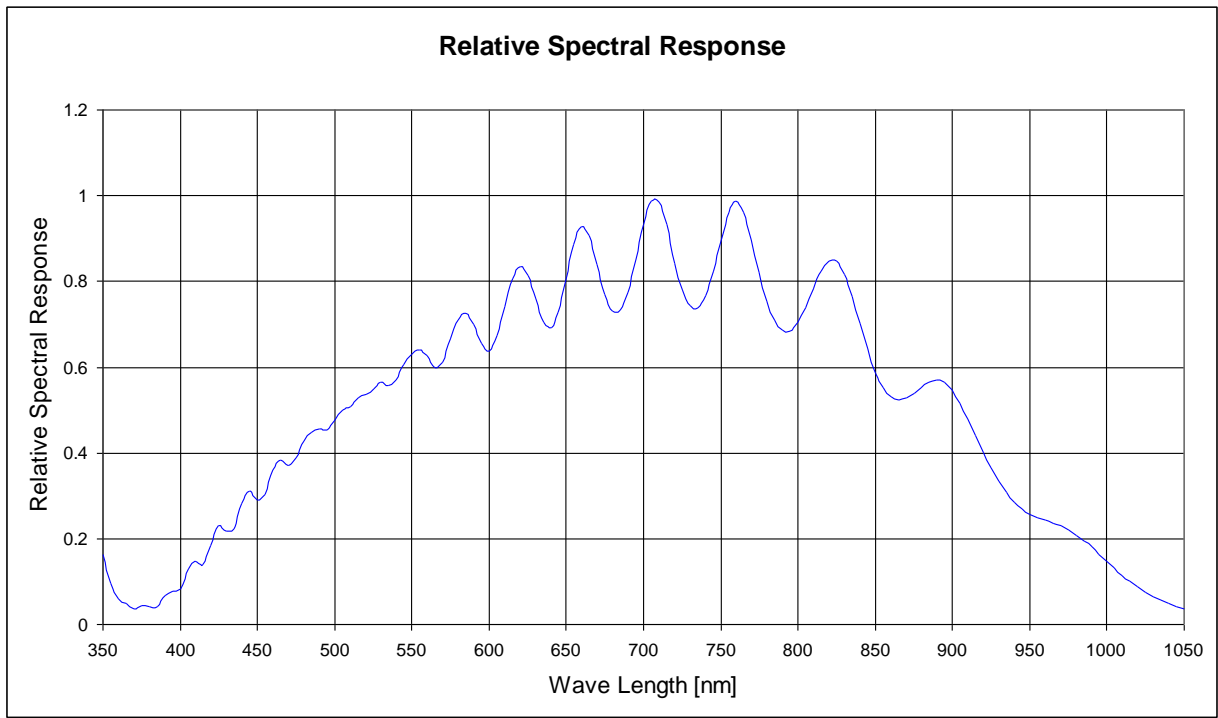


Figure 2

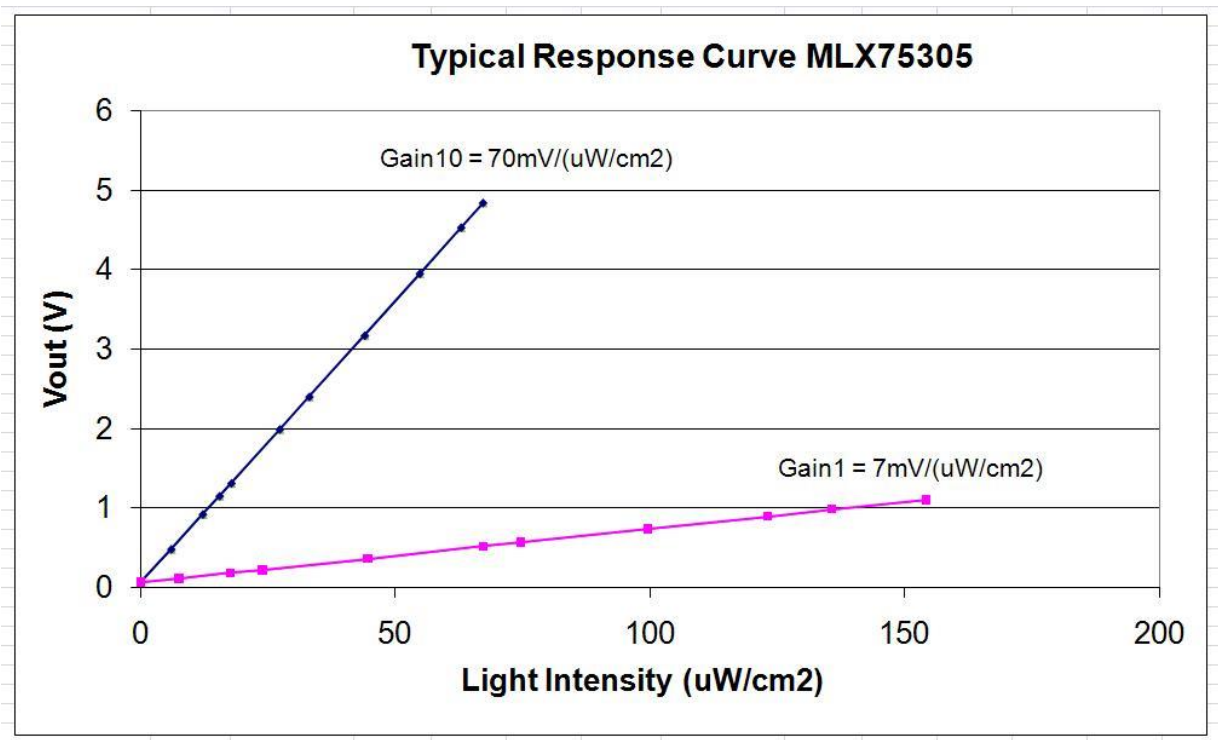


Figure 3

## 10. Timing diagrams

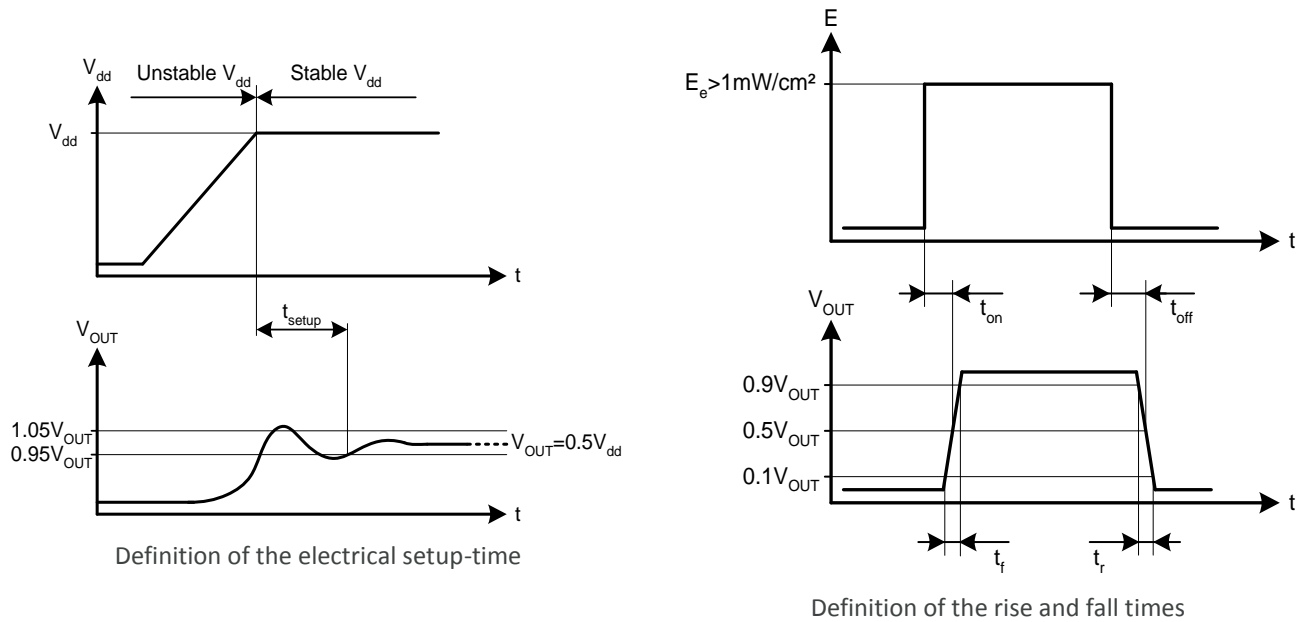


Figure 4

## 11. Applications Information

A typical connection diagram is shown in the figure below. A load resistor  $R_L$  is needed to get the voltage level out. The load capacitance  $C_L$  is typically formed by the input capacitance of the component that is connected to the sensor output, the wiring capacitance and the output capacitance of the sensor itself.

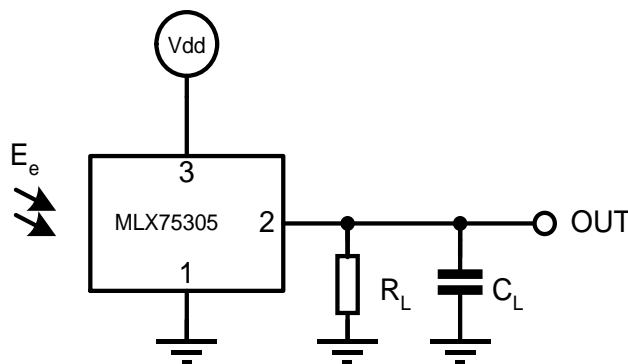


Figure 5

Decoupling capacitors between  $V_{dd}$  and  $V_{ss}$  (1 $\mu$ F in parallel with 100nF) are highly recommended in all configurations.

Recommendation: every change in the application should be agreed by both parties.



## 12. SO8 Open Cavity Package Information

SO8 open cavity package, MSL3, 260°C soldering profile.

Dimensions and marking for MLX75305EXD-AAA-000-RE and MLX75305KXD-AAA-000-RE (gain 10)

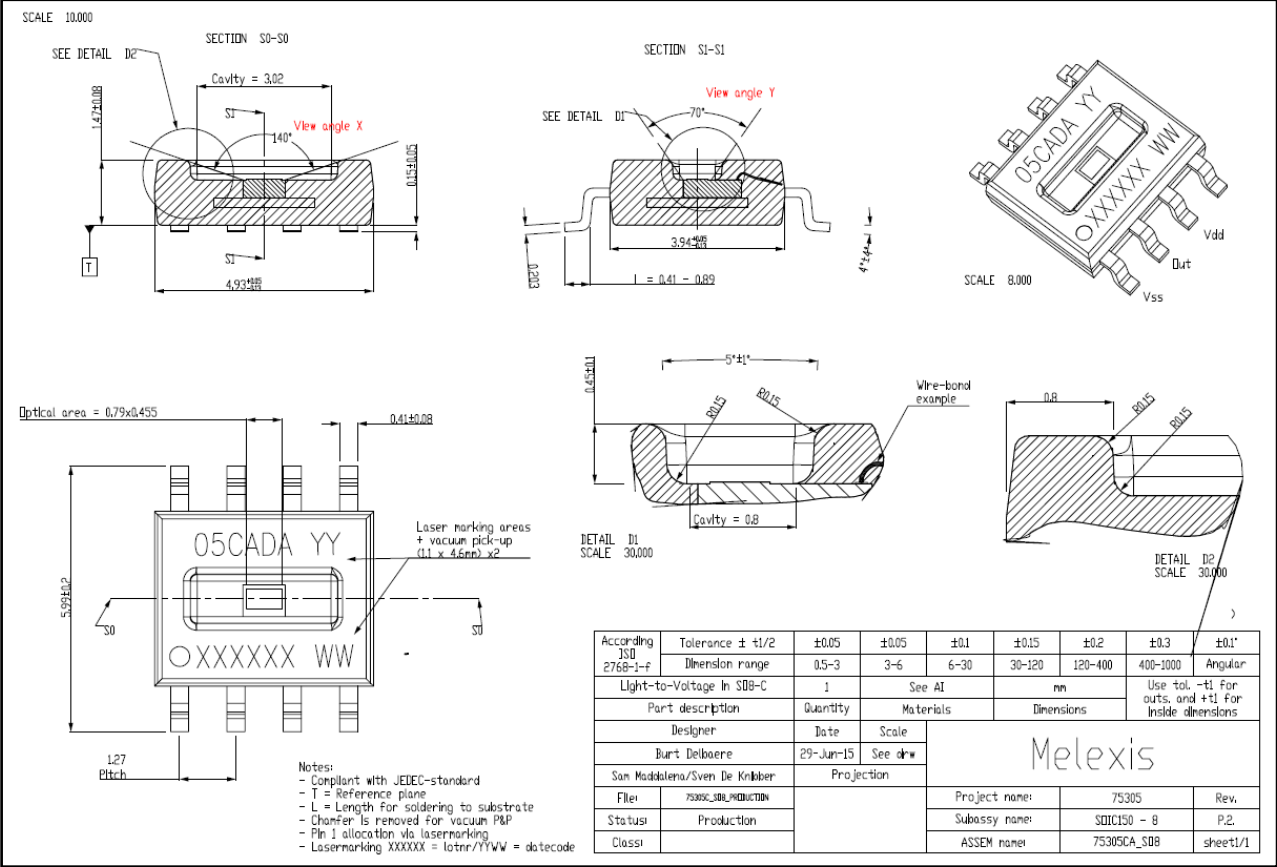


Figure 6

Dimensions and marking for MLX75305EXD-ABA-000-RE and MLX75305KXD-ABA-000-RE (gain 1)

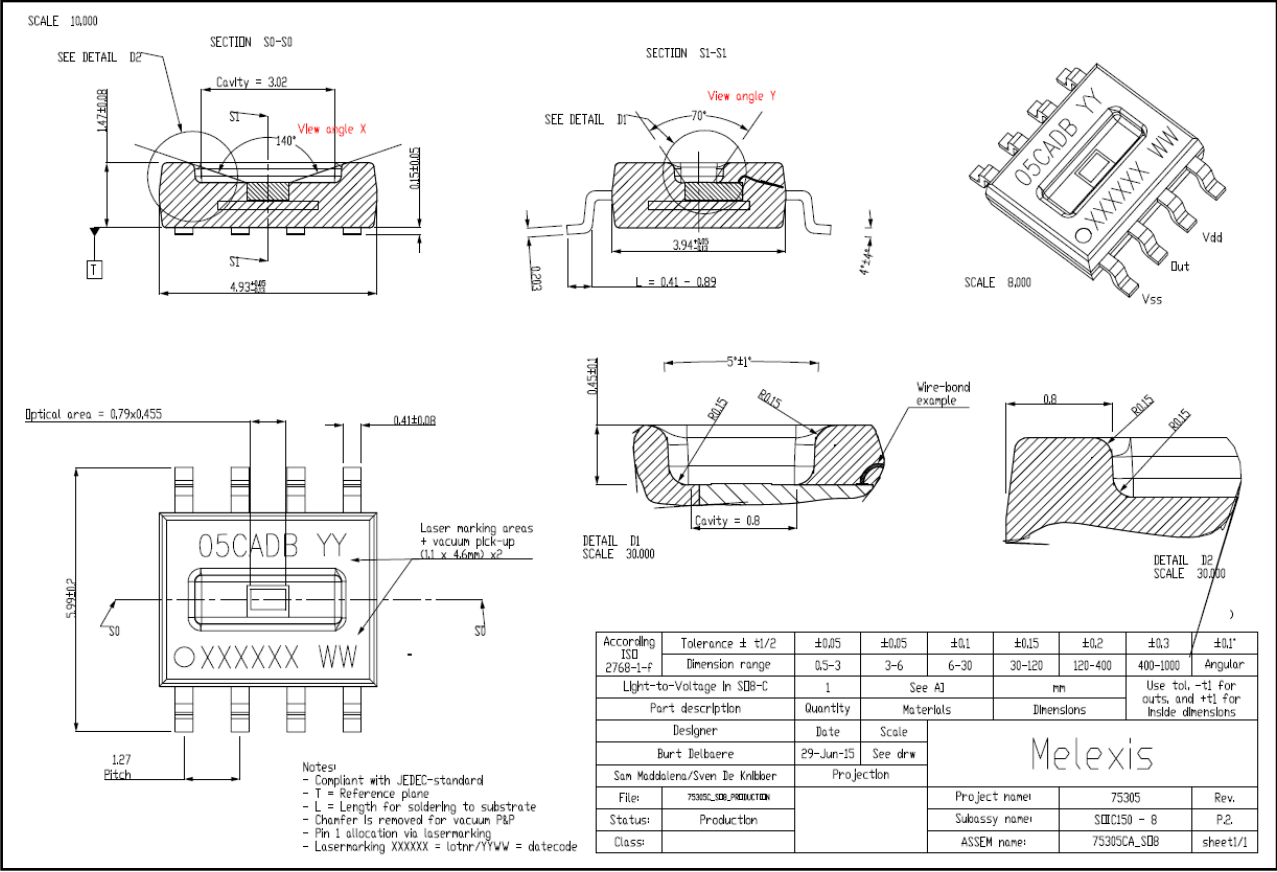


Figure 7

## 13. Standard Information

Our products are classified and qualified regarding soldering technology, solderability and moisture sensitivity level according to standards in place in Semiconductor industry.

For further details about test method references and for compliance verification of selected soldering method for product integration, Melexis recommends reviewing on our web site the General Guidelines [soldering recommendation](#). For all soldering technologies deviating from the one mentioned in above document (regarding peak temperature, temperature gradient, temperature profile etc), additional classification and qualification tests have to be agreed upon with Melexis.

For package technology embedding trim and form post-delivery capability, Melexis recommends to consult the dedicated trim&form recommendation application note: [lead trimming and forming recommendations](#)

Melexis is contributing to global environmental conservation by promoting **lead free** solutions. For more information on qualifications of **RoHS** compliant products (RoHS = European directive on the Restriction Of the use of certain Hazardous Substances) please visit the quality page on our website: <http://www.melexis.com/en/quality-environment>

## 14. ESD Precautions

Electronic semiconductor products are sensitive to Electro Static Discharge (ESD).

Always observe Electro Static Discharge control procedures whenever handling semiconductor products.

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